



Laser activity of the Borowiec laser station in years 2017-2018

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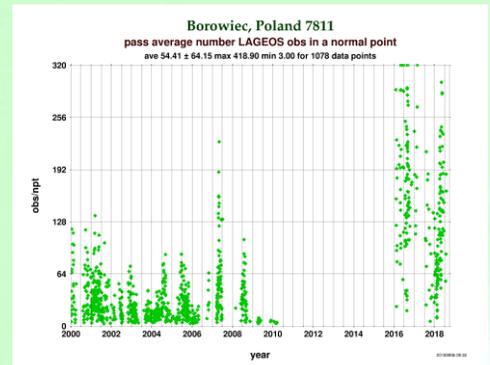
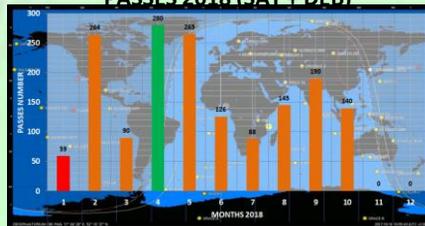
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After big modernization in 2014, the BORL station has entered into new chapter of the laser measurements. With two independent high-energy Nd:YAG pulse laser modules, EKSPLA PL-2250 used for satellites with retros and high-energy module Continuum Surelite III dedicated to Space Surveillance and Tracking (SST) activity, the station is able to track LEO and MEO satellites, as well as space debris targets (LEO defunct satellites and rocket bodies). Currently, BORL station tracks 39 different satellites (LEO/MEO) and 10 different space debris objects (LEO defunct satellites and RB's).

PASSES 2017 (SAT + DEB)



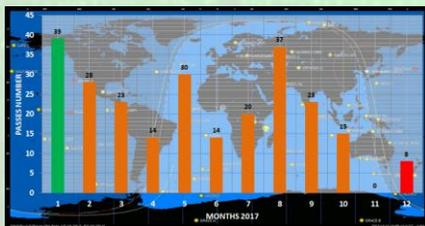
PASSES 2018 (SAT + DEB)



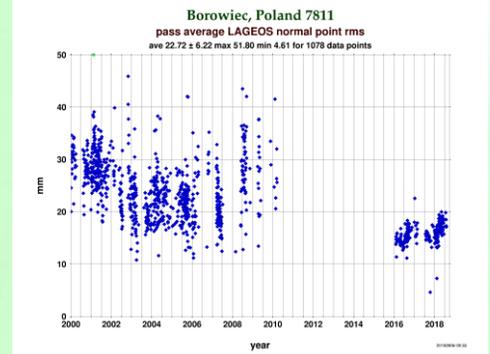
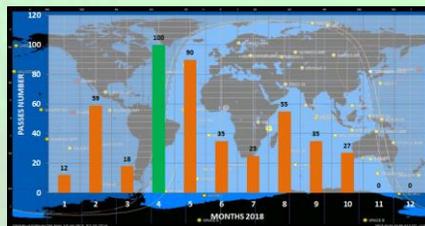
The average RMS of all satellites tracked in 2017 ranged from 1.3 to 6.5 cm (587 passes and 9947 NP's). All results were sent to the data banks at NASA's Crustal Dynamics Data Information System (CDDIS) and the Eurolas Data Center (EDC). Space debris targets are observed in the frame of Space Debris Study Group (SDSG) of the ILRS. In 2017 a total of 251 space debris passes were performed with the average RMS ranging from 5.2 to 81.6 cm (3529 NP's). All results were sent to the SDSG data bank in Graz. In 2018, till October 29, BORL station has performed 1191 passes of LEO/MEO satellites (18342 NP's) ranged from 1.3 to 4.0 cm and 456 passes of LEO space debris (5769 NP's) with the average RMS of the measurements from 2.5 cm to 45.1 cm, respectively.

https://ilrs.../network/stations/active/BORL_performance.html

PASSES 2017 (DEB)



PASSES 2018 (DEB)



At CBK PAN Borowiec a second independent laser system is developed. This system is dedicated to the SST programme. The new system is situated on an azimuth-elevation mount with a 65 cm Cassegrain telescope equipped with servo drives that provide a tracking accuracy below 1 arcsec and a 8" RC guiding telescope, equipped with two fast dedicated CMOS cameras for SLR and light curves/spectrography. The whole system is controlled by a multitask steering/tracking software. At present, the second system is fully operational in optical mode.

SUMMARY

The CBK BORL station made significant progress in the laser activity. In the last two years (2017-2018), the station performance has increased substantially:

- the growth of the tracked targets (SAT + DEB),
- the growth of the single measurements per normal point,
- the growth of operational capabilities.

First time in the history of laser measurements in Poland, the CBK Borowiec station has reached more than 1100 passes. In 2018 (till October 29) the total number of all passes is 1647 (SAT + DEB) and this result still can be improved. For the next years the CBK Borowiec station plan to achieve a full operation devoted to the following activities:

- tracking of MEO and GEO satellites equipped with retros at the distance more than 25000 km,
- day tracking of all ILRS's satellites,
- the increase of the range to SD targets (at present the max. distance is on the level of 1500 km),
- fotometry and spectroscopy of SD targets.

The big turn by CBK Borowiec was made towards SD activity and SST programme. More details about our current work related to the SD can be found in our paper *First laser measurements to space debris in Poland*, *Advances in Space Research*, Vol. 61, Issue 10, pp. 2609-2616, 2018, DOI: <https://doi.org/10.1016/j.asr.2018.02.033.2017>.